SEMICONDUCTOR DEVICE

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Abstract

(a) The gate oxide layer(3) and the contact layer(4) for buried contact part are formed on the substrate where the field oxide film(2) is formed. (b) The polysilicon layer(5) is formed in front of subsrate, and the first impurity region(6) is formed in the contact part substrate region through diffusion process with pocle. (c) The conductive electrode(7) and layer(8) is formed by photoetching using the photoresist layer(9). (d) After overetching, the photoresist is removed. (e) The second impurity layer(12) is formed, and a region is formed by connecting with the first impurity region.

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発明の名称　画像信号処理装置及び画素欠陥の検出方法

本出願に対する審査結果、下記のような拒絶理由があり、特許法第６３条の規定によりこれを通知するので、意見があるか補正を行う必要がある場合は、上記期限までに意見書又は/及び補正書を提出されたい(上記期限について毎回１ヶ月単位で延長を申請することができ、この申請について別途の期間延長承認通知はしない)。

[理　由]

本出願の特許請求範囲第 1 項に記載された発明は、その出願前にこの発明が属する技術分野における通常の知識を有する者が以下に指摘したことにより容易に発明できたものであるため、特許法第 29 条第 2 項の規定により特許を受けることができない。

韓国出願番号 特1995-0016974

[記]

本願の請求範囲第 1 項に記載された発明は、検出回路、判定回路、メモリ回路を備え、画面上の画素欠陥を検出し補正している。

引用発明(韓国公開特許公報 1997-3744；1997. 1. 28. 公開)は、固体撮像素子の欠陥を自動判別するために映像信号格納部、平均値算出部、欠陥判別部、欠陥記録部を備えた発明であって、本願と比較してみれば、

目的において、本願は欠陥画素の補正を最終の目的として欠陥画素を区別しようとしており、引用発明は、欠陥のある固体撮像素子の不適合判別を最終の目的として欠陥画素を区別しようとしている。従って、最終の目的は多少差異があるが、欠陥画素を検出しようとする目的までは同一であると言える。

構成において、本願の検出回路は、引用発明の平均値算出部、判定回路は欠陥判別

APPARATUS FOR AUTOMATICALLY JUDGING DEFECTS IN CHARGE COUPLED DEVICE

ABSTRACT

The present invention relates to an apparatus for judging defects in a charge coupled device (CCD), which is used in a video camera or the like. The automatic judgment apparatus of the present invention comprises a video signal storage portion for storing video signals that have been imaged through the charge coupled device to be inspected, an average calculation portion for calculating an average of signal size of pixels that have been recorded in the video signal storage portion, a defect judgment portion for comparing signal size of each pixel with an average of signal size of pixels and then judging whether or not defects have been generated in each cell of the charge coupled device corresponding to each pixel, a defect record portion for recording defect information on the cells that have been judged that defects have been generated, a pass/fail determination portion for finally determining pass/fail of the cells as a charge coupled device according to the defect information, and a screen display portion for displaying the final determination results. Therefore, according to the automatic judgment apparatus of the present invention, by electrically and automatically judging the pass/fail of the charge coupled device without subjectively judging the pass/fail of the charge coupled device by a inspector as in the prior art, there are advantageous effects in that correct inspection can be carried out, and also in that it takes less time to inspect the charge coupled device.

SPECIFICATION

[TITLE OF THE INVENTION]

Apparatus for automatically judging defects in charge coupled device

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 shows the configuration of a conventional apparatus for judging defects in a charge coupled device.

FIG. 2 shows waveforms that are displayed on a waveform monitor when (a) white

defects and (b) black defects have been generated in the charge coupled device, respectively.

FIG. 3 shows the configuration of an apparatus for automatically judging defects in a charge coupled device of the present invention.

FIG. 4 shows an example of screen split of the present invention.

* Reference numerals relating to major parts of the drawings:

20: white chart
22: lens
24: charge coupled device
26: A/D conversion portion
28: memory address generation portion
30: frame memory
32: average calculation portion
34: defect judgment portion
36: defect position and ratio record portion
38: area division coordinates input portion
40: pass/fail determination portion
42: determination result display portion

[DETAILED DESCRIPTION OF THE INVENTION]

The present invention relates to an apparatus for judging defects in a charge coupled device (CCD), which is used in a video camera or the like. In particular, the present invention relates to an automatic judgment apparatus capable of automatically judging defects in a charge coupled device.

In general, any defects may be generated when charge coupled devices are fabricated. In the same manner as other manufactures, the charge coupled devices are judged in pass/fail as a charge coupled device before delivery, and only the pass charge coupled devices are then placed on the market. The passing or failing as a charge coupled device is judged by examining defects that have been generated in a fabrication process. In particular, it is determined by detecting white and black defects.

A charge coupled device is a photoelectric conversion element that outputs voltage in proportion to a quantity of incident light. Accordingly, the charge couple device does not generate any voltage without incident light. White defects refer to a phenomenon that

even in a case where incident light is blocked, since portions that generate voltage due to defects that are generated in the charge coupled device are generated (see FIG. 2(a)), white spots or lines are shown up in a black background when observed on a monitor. On the other hand, black defects refer to a phenomenon that even in a case where incident light is uniformly applied on a whole face of the charge coupled device, since any voltage is not generated or portions that generate voltage lower than any other portions are generated (see FIG. 2(b)), black spots or lines are shown on a white background when observed through the monitor.

FIG. 1 shows a conventional defect judging apparatus for judging such defects in a charge coupled device. In order to judge whether or not black defects exist in the charge coupled device, a user first images white chart 10 with a video camera. Light that is applied through lens 12 is photoelectrically converted in the charge coupled device 14, and is then outputted on monitor 16 or waveform monitor 18. The user observes whether or not black portions exist. At this point, if the black portions exist on the monitor 16, a ratio of these portions to entire signal size is calculated by using the waveform monitor 18. Thereafter, the ratio is compared with a predetermined reference value for determining pass/fail as a charge couple device, and final determination is then made.

In the mean time, in order to judge white defects, after a lid of lens 12 is closed and incident light is completely blocked, the aforementioned processes are repeated.

Thus, according to the conventional apparatus for judging defects in a charge coupled device, an inspector should macroscopically observe signals that have been imaged by using the charge coupled device to be inspected on a monitor. Therefore, there have been problems in that correct inspection was not carried out, and that it took more time to inspect the charge coupled device.

The present invention is contemplated to solve the above problems of the prior art. An object of the present invention is to provide an apparatus for automatically judging defects in a charge coupled device, in which inspection can be correctly and quickly carried out by electrically judging the defects that have been generated in the charge coupled device.

According to the aspects of the present invention for achieving the above objects,

an apparatus for automatically judging defects is provided in a charge coupled device (CCD) comprising a video signal storage portion for storing video signals that have been imaged through the charge coupled device, an average calculation portion for calculating an average of signal size of pixels that have been recorded in the video signal storage portion, a defect judgment portion for comparing a defect ratio that an error between the average of signal size of pixels and signal size of each pixel occupies in entire video signal size with a predetermined reference ratio and then judging whether or not defects have been generated in each cell of the charge coupled device corresponding to each pixel, a defect record portion for recording defect information on the cells which have been judged that defects have been generated, a pass/fail determination portion for comparing the defect information with a predetermined reference value and then finally determining pass/fail of the cells as the charge coupled device, and a screen display portion for displaying the final determination results.

Hereinafter, a preferred embodiment of the present invention will be described in detail with reference to Figs. 3 and 4.

FIG. 3 shows the configuration of an apparatus for judging defects in a charge coupled device according to the present invention. In FIG. 3, a front face of lens 22 is provided with white chart 20 to be imaged so that incident light can be uniformly applied. A charge coupled device 24 to be inspected is connected to an output end of lens 22. An A/D conversion portion 26 for converting output signals from the charge coupled device 24 into digital signals is connected to an output end of the charge coupled device 24. A frame memory 30 for storing imaged signals every frame is connected to an output end of the A/D conversion portion 26.

An average calculation portion 32 for calculating an average (AVE) of signal size of pixels that have been stored in frame memory 30 is connected to an output end of frame memory 30. A defect judgment portion 34 for comparing these output signals every pixel and then judging whether or not defects are generated in cells of the charge coupled device corresponding to the pixels is connected to the output end of frame memory 30 and an output end of the average calculation portion 32. A defect position and ratio record portion 36 for storing positions of the cells in which defects have been generated and a

ratio of the defects to the entire signal size is connected to an output end of the defect judgment portion 34. A memory address portion 28 for receiving horizontal and vertical synchronizing signals (VD, HD), generating address signals (ADDR) showing positions in a screen, and outputting them to portions 30, 36 is connected to input ends of the frame memory 30 and the defect position and ratio portion 36.

A pass/fail determination portion 40 for determining pass/fail of the charge coupled device by comparing the defect judgment results with a predetermined reference value for determining pass/fail as an element is connected to output end of the defect position and ratio record portion 36. An area division coordinates input portion 38 for applying boundary coordinates (area 1: $(x_1, y_1) \sim (x_4, y_4)$; area 2: $(x_5, y_5) \sim (x_8, y_8)$) of each area to the pass/fail determination portion 40 when the entire screen is divided into several areas is also connected to the input end of the pass/fail determination portion 40. Finally, a determination result display portion 42, for displaying the determination results on the screen so that the user can recognize them, is connected to an output end of the pass/fail determination portion 40.

The operation of the present invention constructed as such will be described.

When detecting white defects, an inspector first closes a lid of lens 22 to completely block incident light. If the inspector operates an external switch that informs inspection start, the charge coupled device 24 converts light signals in a state where the incident light is blocked into electric signals. The A/D conversion portion 26 receives the photoelectrically converted analog signals and converts them into digital signals. The Frame memory 30 receives the digitally converted signals and stores the signals every frame. At this point, in order to minimize the influence of noise, several frames of signals are integrated, averaged and then stored in frame memory 30.

The average calculation portion 32 calculates an average (AVE) of the entire video signal size by adding all of signal size of pixels that have been recorded in frame memory 30 and then dividing the added value by the total number of pixels, and later outputting it to the defect judgment portion 34. The defect judgment portion 34 calculates ratio or percentage of an error, which is obtained by subtracting the average (AVE) of the entire video signal size from the signal size of pixels that have been recorded in the frame

memory, to the entire video signal size as follows:

$$DefectRatio=\frac{|CurrentSignalSize-Average|}{EntireVideoSignalSize}$$

The defect judgment portion 34 judges that the defects have been generated, in a case where the obtained defect ratio becomes greater than the predetermined reference value, and then outputs the ratio to the defect position and ratio record portion 36. The defect position and ratio record portion 36 records the positions of pixels in which the defects have been generated and a defect ratio, when a signal having a ratio larger than the predetermined reference ratio, is applied. When the positions in which the defects have been generated are recorded, the same values as the address values (ADDR) that are applied from the memory address generation portion 28 to frame memory 30 are used.

In the mean time, it has a tendency that the inspector concentrates on the center of the screen. Accordingly, the defects that have been generated in the center are more easily recognized than the defects generated in the periphery. According to the present invention, as shown in FIG. 4, the screen is divided into several areas from the center thereof. When the defects that have been generated in each area are examined and finally determined, area 1 preferentially weighs.

The area division coordinates input portion 38 outputs boundary coordinates (area 1: $(x_1, y_1) \sim (x_4, y_4)$; area 2: $(x_5, y_5) \sim (x_8, y_8)$) showing each area to the pass/fail determination portion 40. The pass/fail determination portion 40 stores the reference value that is used to judge the pass/fail as the charge coupled device to each area. The pass/fail determination portion 40 compares the degree of defects (the number of cells in which defects are generated and the defect ratio) that have been generated in each area with the predetermined reference, and then finally judges the pass/fail as the charge coupled device. If the fail determination is made in area 1, the pass/fail determination on areas 2 and 3 are not judged anymore. The pass/fail determination portion 40 outputs the determination results to the determination result display portion 42 so that the user can recognize the determination results.

On the other hand, when black defects are detected, white chart 20 is imaged with a video camera, and light is then uniformly applied to a front face of the charge coupled

device. Here, by obtaining a ratio of black portions on the monitor to the entire video signal size, the pass/fail of the charge coupled device is finally judged. Since the other processes are the same as the aforementioned judgment processes of the white defects, the description thereof will be omitted.

Thus, according to the automatic judgment apparatus of the present invention, by electrically and automatically judging the pass/fail of the charge coupled device without subjectively judging the pass/fail of the charge coupled device by the inspector as in the prior art, there are effects in that correct inspection can be carried out, and also in that it takes less time to inspect the charge coupled device.

CLAIMS

1. An apparatus for automatically judging defects in a charge coupled device (CCD), comprising:

a video signal storage portion for storing video signals that have been imaged through the charge coupled device;

an average calculation portion for calculating an average of signal size of pixels that have been recorded in the video signal storage portion;

a defect judgment portion for comparing a defect ratio that an error between the average of signal size of pixels and signal size of each pixel, occupies in entire video signal size with a predetermined reference ratio and then judging whether or not defects have been generated in each cell of the charge coupled device corresponding to each pixel;

a defect record portion for recording defect information on the cells which have been judged that defects have been generated;

a pass/fail determination portion for comparing the defect information with a predetermined reference value and then finally determining pass/fail of the cells as a charge coupled device; and

a screen display portion for displaying the final determination results.

2. The apparatus as claimed in Claim 1, wherein the video signal storage portion comprises an A/D conversion portion for converting the analog video signals that have been imaged through the charge coupled device into digital signals; and a frame memory for recording the digitally converted video signals in every frame.

3. The apparatus as claimed in Claim 2, wherein the frame memory records values that are obtained by integrating and averaging several frames of the imaged video signals.

4. The apparatus as claimed in Claim 1, wherein the defect record portion can classify each defect by recording horizontal and vertical address signals showing positions on a screen of the cells in which defects have been generated, and defect information on a

defect ratio that is applied to the defect determination portion.

5. The apparatus as claimed in Claim 1, wherein the pass/fail determination portion determines defects in the charge coupled device by dividing the screen into a predetermined number from the center thereof and setting up a reference to pass/fail determination corresponding to each area.

6. The apparatus as claimed in Claim 5, wherein the pass/fail determination portion further comprises a coordinates input portion for applying boundary coordinates of each area to the pass/fail determination portion.